**Wavelength-Agile Optical Rocket Propulsion Sensor (WORPS)**

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Proposal No.: 02-I020069

Identification and Significance of Innovation

ORBITEC and the University of Wisconsin-Madison propose to develop a wavelength-agile optical rocket propulsion sensor (WORPS) to interrogate rocket exhaust plumes and cryogenic fluid properties. WORPS can interrogate temperature, pressure, and multiple species concentrations in gases at arbitrary conditions and can simultaneously monitor liquid properties, all with a simple design. WORPS can also record gas temperature distributions rather than just the path-averaged temperature. These capabilities represent a dramatic enhancement of the best diode-laser sensors available two years ago, which were not wavelength-agile.
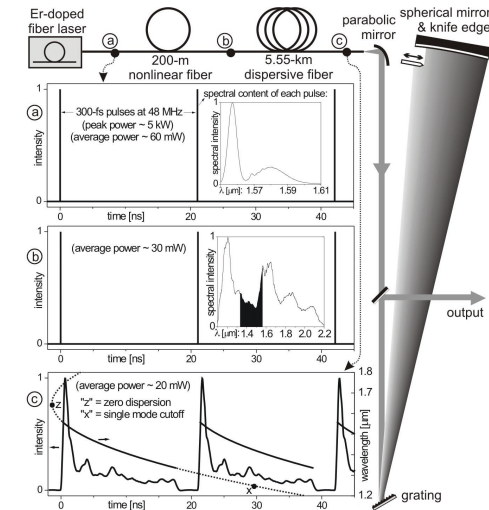
Technical Objectives

- Design and assemble a WORPS system
- Demonstrate WORPS with flat flame burner, pressurized gas cells
- Demonstrate ability to interrogate LOX volumes for trace materials
- Demonstrate interrogation of rocket exhaust plumes
- Analyze and interpret experimental data
- Design an updated sensor system for Phase II.

Work Plan

1. WORPS System Design and Assembly
2. WORPS System Laboratory Tests
3. WORPS System Installation at ORBITEC
4. Chemical Equilibrium Analysis
5. WORPS Rocket Exhaust Plume Testing
6. Data Analysis and Interpretations
7. Phase II WORPS System Design
8. Management and Reporting

NASA Applications

Potential NASA applications include use for propulsion system monitoring in NASA test facilities. WORPS could potentially find use as a diagnostic tool for on-orbit microgravity combustion, gas, and fluid experiments aboard the Shuttle and ISS. Real-time, in-flight monitoring of the SSME for propulsion system health represents another applications for the mature WORPS system.

Non-NASA Applications

WORPS can be applied to virtually all types of engines and associated systems as well as many industrial process monitoring applications. Large industries that may find the technology attractive include the automotive industry, the commercial aircraft industry, and the power production industry for coal, oil, and natural gas burners.

Contact Information

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